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| <b>(54) Title:</b> PHEROMONE COMPOSITION  |  |   |  |
| <b>(57) Abstract</b><br><p>The invention provides compositions formulated to attract fish, comprising at least one human female pheromone such as trimethylamine, pyrroline and salts thereof, steroids of the androstene family such as 5-alpha-androst-16-en-3-alpha-ol, heterocyclic compounds such as indole and skatole and alkanolic acid compounds such as 4-methyloctanoic acid. Compositions can be formulated as liquids for direct application to bait, hooks or flies. Plastic bait can be manufactured including the composition. The composition can be used to attract fish by fishermen and anglers or to guide fish into paths to enable them to cross dams.</p> |  |   |  |

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1     PHEROMONE COMPOSITION

2

3     The invention relates to compositions formulated to  
4     attract fish, in order to capture them. More  
5     particularly the composition may be used in a liquid  
6     form to be applied onto or into bait, lures or flies  
7     which are used by anglers and commercial fishermen  
8     alike.

9

10    Angling and fishing are sports which attract a large  
11    number of people. A wide range of bait, lures and  
12    flies are marketed at these persons in order to provide  
13    them with more success in catching fish.

14

15    Some organic compounds are known to be active in the  
16    feeding response of some species by enhancing feeding  
17    or attracting fish to a general area. They are known  
18    to occur at low concentration levels in crustacea and  
19    also in a range of decomposing animals. Such compounds  
20    are small organic odorants.

21

22    It has been reported that women have a greater success  
23    rate in catching salmon than male anglers (see *Salmon*  
24    *and women*, W. Paterson & P. Behan, published by H, F &  
25    G Witherby Ltd 1990).

1 It is an object of the invention to provide a  
2 composition showing enhanced attracting effects on  
3 fish.

4  
5 It is another object of the invention to provide a  
6 method to attract fish by using the composition of the  
7 invention.

8  
9 It is a further object of the invention to provide the  
10 composition of the invention to be applied to bait  
11 (live or dead), lures or flies (dry or wet) used in the  
12 practise of angling or commercial fishing.

13  
14 It has surprisingly been found that compositions  
15 containing at least one human female pheromone presents  
16 an unexpectedly good attractive effect on fish, and  
17 particularly on salmon. Such compositions may be  
18 applied on any kind of bait used by anglers and  
19 fishermen.

20  
21 Herein the term "pheromone" is taken to include amines  
22 such as trimethylamine and pyrroline, and salts  
23 thereof, steroids of the androstene family such as 5-  
24 alpha-androst-16-en-3- $\alpha$ -ol, heterocyclic compounds  
25 including nitrogen and/or sulphur such as indole and  
26 skatole and alkanoic acid compounds such as 4-  
27 methyl-octanoic acid.

28  
29 The objects of the invention are achieved with a fish  
30 attracting composition comprising at least one human  
31 female pheromone, or a synthetic nature-similar version  
32 of the latter.

33  
34 In one embodiment the invention provides at least one  
35 female human pheromone together with an acceptable  
36 carrier.

1 Alternatively the composition can comprise a synthetic  
2 female pheromone with a carrier. Preferably the  
3 carrier solubilises the compound.

4  
5 Preferred carriers include aliphatic alcohols such as  
6 ethanol, monoethylene glycol and propylene glycol.

7  
8 It is preferred that the pheromone used in the  
9 composition of the invention be at least trimethylamine  
10 or one volatile steroid of the androstene family  
11 together with at least one compound chosen from a  
12 complex array of alkanolic acids, including those having  
13 a carbon atom number ranging from C4 to C10 and  
14 especially substituted acids having a carbon atom  
15 number ranging from C8 to C10.

16  
17 A particularly preferred composition comprises at least  
18 one salt of trimethylamine (typically the  
19 hydrochloride) and 5- $\alpha$ -androst-16-en-3- $\alpha$ -ol.

20  
21 A preferred composition according to the invention may  
22 comprise in association with nature-similar versions of  
23 human female pheromones, a suite of other potent aroma  
24 chemicals (referred to herein as Key Impact Odorants  
25 [KIOs]) which occur in both fresh and decomposing  
26 animal tissue.

27  
28 These other KIOs can be special amines and associated  
29 heterocyclic compounds including nitrogen and sulphur  
30 such as indole and skatole. It is also preferred that  
31 the odorant compounds be provided with concentrations  
32 of several order of magnitude higher than the ones  
33 which are found in conventional bait.

34  
35 The composition of the invention can be used in various  
36 embodiments.

1 In one embodiment the composition is a liquid which  
2 bait, lure, fly, ground bait and/or hooks can be dipped  
3 into or the liquid can be poured onto the bait, lure,  
4 fly, ground bait and/or hooks.

5  
6 The composition of the invention may also be formulated  
7 as a spray to allow easy manipulation by the users and  
8 could either be hand pumped or gas driven.

9  
10 In a preferred embodiment the composition is formulated  
11 to be injected into bait.

12  
13 Alternatively the composition can be incorporated into  
14 plastic bait.

15  
16 To attract fish one may apply the composition of the  
17 invention on a bait or a suitable support and provide  
18 it in area where fish are used to be found.

19  
20 The composition may also be applied directly onto bare  
21 hooks.

22  
23 The composition of the invention can be formulated for  
24 a wide range of applications including combining with  
25 floatant, spraying flies, combining with greasing or  
26 degreasing agents to enable bait to float or sink as  
27 required.

28  
29 The formulation can also be combined with ground bait  
30 and dried for storage purposes.

31  
32 Formulations of the present invention are surprisingly  
33 effective in aqueous solution. Whereas a preferred  
34 carrier is ethanol and a basic formulation can include  
35 a salt of trimethylamine in ethanol, in use the  
36 formulation produces trimethylamine on contact with

1 water. In fishing, the formulation will be vastly  
2 diluted in water and therefore it is most surprising  
3 that use of the formulation can effectively enhance  
4 fishing.

5

6 The pheromones which may be advantageously used in a  
7 composition according to the invention include the  
8 following:

9

10 Trimethylamine (TMA) (as derived from a salt of  
11 trimethylamine such as the hydrochloride) is an  
12 exceptionally interesting KIO pheromone. It occurs on  
13 human skin and is especially important for females. It  
14 is the characteristic odour of a menstruating female.  
15 The odour profile is distinctive and is not shared by  
16 closely related amines such as, for example,  
17 dimethylamine. The aroma is that of fresh shell fish  
18 at the threshold level. In fact it is thought that  
19 most of the charm of oyster, scallops and the like  
20 comes from TMA. The aroma changes with increasing  
21 concentration and becomes increasingly unpleasant. At  
22 a high level TMA will be perceived as an off-odour in  
23 shell fish and the like, and as a sign of lack of  
24 hygiene in a human subject.

25

26 The threshold concentration for humans is about 1ppb (1  
27 part in  $10^9$ ) - this is low by olfactory standards.  
28 There is, in fact, great individual variability and the  
29 concentration varies around the mean figure by about 3  
30 orders of magnitude. This gives rise to great  
31 variability; for example, a crustacean may appear  
32 delightful to a person of high threshold but may be  
33 abhorrent to a person of low threshold (skin  
34 sensitivity). See in that matter "Ageing and the Sense  
35 of Smell" C, Van Toller, GH Dodd & A Billing, Charles T  
36 Thomas, Publisher, Springfield, Illinois, USA, 1985.

1 Another interesting pheromone to be used in the fish-  
2 attracting composition is 1-Pyrroline. This is a rare  
3 and little studied human pheromone. It is unstable and  
4 therefore very difficult to study. It is formed by  
5 oxidation of precursor molecules such as 1,4-  
6 diaminobutane and 1,4-diaminopentane. These amines  
7 occur in a variety of human tissues, and can be formed  
8 from appropriate amino acids.

9  
10 In order to overcome the instability problem when 1-  
11 Pyrroline is to be used in a fish-attracting  
12 composition of the invention, the parent amines (i.e.  
13 the above mentioned precursors) are incorporated at a  
14 high level in the composition. They will slowly  
15 oxidize and release the unstable active odorant.

16  
17 These parent amines are also called respectively,  
18 putrescine and cadaverine, for obvious olfactory  
19 reasons and occurred in decomposing animal tissue. The  
20 human threshold is in the ppb range.

21  
22 A further preferred pheromone is the 5- $\alpha$ -androst-  
23 16-en-3- $\alpha$ -ol. This pheromone is a well-known pheromone  
24 which is found in both males and females but is thought  
25 to be more important for women (in contrast to the  
26 related steroid pheromone,  $\alpha$ -androstenone). The  
27 threshold for human is in the low ppb range. The odour  
28 is usually described as musky.

29  
30 A still further preferred pheromone is 4-Methyloctanoic  
31 acid which is characteristic of the scalp odour and may  
32 be found in gamey meat. The threshold is unusually low  
33 for a fatty acid and is in the region of ppb. It is  
34 has been reported that women are much more sensitive to  
35 this odorant than men.

36



1 A particular composition according to the invention has  
2 been tested in fishing experiments on the River Ness,  
3 other rivers in the Highlands, and in Ireland and on a  
4 variety of Lochs. Positive results have been obtained.

5  
6 The composition of this particular non-limiting  
7 composition is the following :

| 8  | 9  | Component No | Name                             | Amount Required for<br>1000 litres of<br>solvent (ethanol) |
|----|----|--------------|----------------------------------|--|
| 10 |    |              |                                  |  |
| 11 |    |              |                                  |  |
| 12 |    |              |                                  |  |
| 13 | 1  |              | Trimethylamine                   | 7kg  |
| 14 |    |              | hydrochloride                    |  |
| 15 | 2  |              | 1,4 diaminobutane                | 0.7kg  |
| 16 | 3  |              | 1,4 diaminopentane               | 0.1kg  |
| 17 | 4  |              | indole                           | 50 grm   |
| 18 | 5  |              | skatole                          | 40 grm   |
| 19 | 6  |              | isovaleric acid                  | 40 grm   |
| 20 | 7  |              | 4-methyloctanoic acid            | 10 grm   |
| 21 | 8  |              | 4-methylnonanoic acid            | 5 grm  |
| 22 | 9  |              | phenylacetic acid                | 20 grm   |
| 23 | 10 |              | 2-methyl-E-butenic acid          | 5 grm  |
| 24 | 11 |              | 4-methylpentanoic acid           | 10 grm   |
| 25 | 12 |              | 2-methyl-2-pentenoic acid        | 10 grm   |
| 26 | 13 |              | 5-alpha-androst-16-en-3-alpha-ol | 60 mg-6g   |

27  
28 A more general preferred composition comprises

| 29 | 30 | Component No | Name          | Amount Required for<br>1000 litres of<br>solvent |
|----|----|--------------|---------------|--|
| 31 |    |              |               |  |
| 32 |    |              |               |  |
| 33 |    |              |               |  |
| 34 | 1  |              | KIO Pheromone | 0.05-50kg  |
| 35 | 2  |              | Alkanoic acid | 5g-1.5kg   |
| 36 | 3  |              | Amines        | 0.1kg-8kg  |

1 Even if a special emphasis has been given on the  
2 utility of the composition in order to ease fishing it  
3 is understood that the composition to attract fish as  
4 above described may be used for other purposes. For  
5 example it may be used to attract salmon into special  
6 paths provided in order to help them to cross dams,  
7 waterfalls or other obstructions.

8

#### 9 Experimental Study

10

11 An initial study was carried out to establish a  
12 relationship between the use of female pheromones at a  
13 chosen concentration and the increase in the catch of  
14 salmon, either by fish size or numbers caught using the  
15 conventional rod and line method with a selected range  
16 of hand tied salmon flies.

17

18 Three specialist salmon fly fishermen were chosen who  
19 regularly fished prime salmon rivers, have extensive  
20 combined specialist knowledge gained from 20 years of  
21 fly fishing, fish a regular pattern over the entire  
22 season, have experience of observing changes and  
23 variations in fish runs and catch methods and were  
24 willing to comply with strict rules with regard to  
25 reporting procedures.

26

27 Rivers chosen for the study covered the entire salmon  
28 cycle, i.e Spring-Summer and Autumn salmon runs,  
29 January-September 1997.

30

#### 31 Results

32

33 Some interesting findings came to light at the season  
34 end:

35

1 Of the three subjects chosen, all had a significant  
2 change in their catch pattern, (1) 43 salmon caught (2)  
3 75 salmon caught (3) 15 salmon caught.

4  
5 Subjects (1) and (2) fly fished the middle/upper  
6 reaches of a major salmon river. The river is world  
7 famous for the range of salmon fishing available.  
8 Spring salmon run (10-25lbs) is moderate. Large runs  
9 of Summer grilse (3-8 lbs) and a good run of Autumn  
10 salmon (10-30 lbs).

11  
12 Subject (3) fly fished a major East Coast spring salmon  
13 fishery (10-30 lbs) This river has small runs of summer  
14 salmon owing to licensed commercial fishing in estuary  
15 waters.

16  
17 In all cases the reports returned were similar with  
18 more consistent catches particularly when fish were in  
19 holding pools (when water levels receded after floods).

20  
21 Catch summary (Salmon caught)

|    |         |      |      |
|----|---------|------|------|
| 22 |         |      |      |
| 23 | Subject | 1996 | 1997 |
| 24 | (1)     | 37   | 75   |
| 25 | (2)     | 18   | 43   |
| 26 | (3)     | 9    | 15   |

27  
28 No exceptional fish size was reported over that of the  
29 1996 season.

30  
31 Water levels for 1997 were consistently high by  
32 comparison to 1996 resulting in concentration of  
33 several salmon runs in holding pools throughout the  
34 entire river system.

35  
36 Current information on official commercial salmon catch

1 ventures for 1997 would indicate a 20% reduction on the  
2 1996 season.

3  
4 Water temperatures were slightly higher than previous  
5 years.

6  
7 Most salmon for this study were caught on an imitation  
8 shrimp fly dressing of various sizes.

9  
10 All subjects chosen for this study were male with  
11 average age of 45 years.

12  
13 All subjects chosen tie their own flies, however,  
14 similar selected shrimp/prawn flies were distributed to  
15 all.

16  
17 Salmon flies used were purchased from local fishing  
18 tackle shops.

19  
20 The final results of this initial trial study would  
21 indicate some relationship between the choice of fly  
22 with sample female pheromone and the traditional fly  
23 fishing method.

24  
25 One fisherman has fished for Sea Bass (commonly known  
26 as Salmon Bass) off the east coast for many years, with  
27 varying success. This specialist fishing activity  
28 fished off chosen rocky points in July/August would  
29 normally yield 1-2 fish per outing. This year, using  
30 identical fishing lures, substantially improved bass  
31 catches were recorded with better than average sizes  
32 using the female pheromone formulation described  
33 herein. Other specialist bass anglers fishing the same  
34 waters did not use the formulation and did not return  
35 above average catches.

## 1 CLAIMS

2

3 1. A fish attracting composition comprising at least  
4 one human female pheromone, or a synthetic nature-  
5 similar version thereof.

6

7 2. A composition as claimed in claim 1 comprising a  
8 human female pheromone or a synthetic nature-  
9 similar version thereof together with an  
10 acceptable carrier.

11

12 3. A composition as claimed in any of the previous  
13 claims wherein the carrier is an aliphatic alcohol  
14 or propylene glycol.

15

16 4. A composition as claimed in any of the previous  
17 claims wherein the pheromone is at least one  
18 volatile steroid of the androstene family together  
19 with at least one compound chosen from a complex  
20 array of alkanolic acids.

21

22 5. A composition as claimed in any of the previous  
23 claims wherein the composition comprises  
24 trimethylamine hydrochloride and 5- alpha-androst-  
25 16-en-3- $\alpha$ -ol.

26

27 6. A composition as claimed in any of the preceding  
28 claims wherein the composition is a liquid.

29

30 7. A composition as claimed in any of the preceding  
31 claims which is formulated for injection into  
32 bait.

33

34 8. A composition as claimed in any of claims 1-6  
35 which is formulated as a spray.

36

1     9.   Plastic bait including the composition as claimed  
2         in any of claims 1-6.

3  
4     10.   Dried ground bait including a composition as  
5         claimed in any of claims 1-5.

6  
7  
8  
9

10  
11         /u/mur/specs20/p20686-

# INTERNATIONAL SEARCH REPORT

Internat. Application No

PCT/GB 98/02941

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A01N45/00 A01K97/04 //(A01N45/00, 43:38, 37:10, 37:06, 37:02, 33:04)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A01N A23K A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | FR 2 561 871 A (GROUPE ETU REALISA<br>NAVALES) 4 October 1985<br>see page 1, line 12 - page 4, line 28<br>see page 4, line 38 - page 5, line 6<br>see page 6, line 20 - line 30<br>see page 7, line 2 - line 11<br>see page 7, line 24 - line 38<br>see page 9, line 17 - page 10, line 6 | 1,2                   |
| A          | WO 83 00417 A (NORDTEND AS)<br>17 February 1983<br>see page 3, paragraph 2 - page 6,<br>paragraph 1   | 4,5                   |
| X          | see page 8, last line - page 10, paragraph<br>3; claims 7,9; examples 5E,,6M<br>---<br>-/--   | 1-3,6-10              |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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# INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | EP 0 219 416 A (NAVALES RECH GRP)<br>22 April 1987<br>see page 2, line 3 - line 60<br>see page 4, line 18 - line 59<br>see claims 22,23,32-34; examples<br>5,6,10,16,19     | 1,2,6,7,<br>9,10      |
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